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UNIVERSITY OF RHODE ISLAND

INTERNATIONAL CENTER FOR MARINE
RESOURCE DEVELOPMENT

Annual Report

for

ACTIVITIES UNDER 211(d) GRANT AID/CSD #2455

May 1969 - June 30, 1970

University of Rhode Island International Center for Marine Resource Development



To help emerging nations make and carry out sound resource development policies, the United States government has given initial support to a number of international centers at universities in this country. In 1969 such a center was instituted at the University of Rhode Island to develop expertise in the problems associated with the development of marine resources.

The University of Rhode Island already has a strong graduate program in oceanography and well-developed programs in such areas as ocean engineering and food and resource economics, and the international program is being built upon this foundation.

THE PROGRAM

Building long-range economic prosperity in a developing country depends to a large extent on providing not only for production, but for processing, transportation and marketing systems for its resources. For this reason work in resource development involves specialists in economics and sociology as well as in the more obviously related disciplines. The program at the URI Center is interdisciplinary with the objective of training experts from developing countries and United States advisers to analyze the resource situation in a given country and plan wisely for development.

The activities of the Center include the following:

- Fellowships and assistantships for graduate students in such areas as biology, food technology, economics and sociology to prepare persons for resource development work.
- Encouraging research useful in international resource development by grants-in-aid to faculty members involved in such research.
- Encouraging and building, through existing departments, programs of study related to marine resource development in underdeveloped countries, and providing the library and research support for such curriculums.
- Bringing outstanding scholars together in seminars and symposiums to discuss subjects which are related to resource development assistance.
- Publishing material resulting from symposiums or from individual research that furthers the work of the Center.
- Bringing each year one or two distinguished workers with experience in the problems of economic and social development to the campus to pursue scholarly work and interact with faculty and students.
- Cooperating with other institutions in the United States and abroad on development programs.
- Offering consulting and other services on projects dealing with marine resource problems of developing countries.

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TRAINING AND RESEARCH

The Center is presently working to expand certain existing study programs on the campus to deal with international marine resource problems across department lines. Field study, seminars, visiting lectureships, and new courses will all contribute to this widening of the existing base. Faculty members in anthropology and food and resource economics who are experienced in international development have already been brought to the campus by the Center.

The development of a fishery in an underdeveloped country, for instance, is not just a matter of techniques, but must take into account the economic and social structure of the country. The technical, economic, and social aspects of harvesting, processing, transportation and distribution must be considered. The food itself must be an acceptable one in that society. The labor force and its skills, capital resources and available foreign exchange must be considered. Only on the basis of all these factors can recommendations be made to put the development impetus behind aquaculture vs. agriculture or aquaculture vs. industry to bring the greatest return to the country concerned.

Graduate study and the opportunity to prepare theses related to such questions is offered.

The Center is planning to accept and train greater numbers of individuals from the developing countries in various aspects of marine resource use and development. Such education will be available on a non-degree or special training basis as well as for regularly enrolled graduate students. It will also eventually be possible for the Center to train teams for specific assignments in the international community.

APPLICATIONS

For Graduate Study. American and international students may apply for graduate study preparing for international marine resource development work. Preference is given to highly qualified students from developing countries. They must be proficient in English as demonstrated by an acceptable TOEFL score. They will be enrolled in existing departments and programs (see list below). Application for graduate study should be made to the Graduate School, Green Hall, Kingston, R.I. 02881. Graduate catalogs will be sent on request. Students from abroad should apply to Director for International Student Affairs, Taft Hall, Kingston, R.I. 02881.

For Fellowships and Research Assistantships. Application for fellowships or graduate study preparing for careers in developing countries should be made to the International Center for Marine Resource Development, Upper College Road, Kingston, R.I. 02881. Research assistantships will be awarded through the faculty member

who is in charge of the research and application should be made to the department concerned or to the Center.

For Visiting Workers. Persons from other institutions who have experience and special knowledge in development problems and wish to work on the URI campus for a year and exchange ideas with the resident faculty may apply by letter to the Director of the Center. The stay will usually not exceed a year and applicants with support from their parent institutions will be given preference.

For Special Programs and Services. Other institutions in the United States or abroad which are interested in planning cooperative programs with the University of Rhode Island and its Center for International Marine Resource Development should write to the Director of the Center, Upper College Road, Kingston, R.I. 02881. Programs should be related to the special competence of the URI staff. The Center has such a relationship at present with the University of Florida at Gainesville on problems relating to tropical agriculture and coastal zone resources.

Organizations or individuals seeking consulting services on specific marine resource problems in developing countries should contact the Director of the Center. Contract agreements may be worked out with the Center to deal with special technical assistance and team investigation in the field.

For Further Information

Dr. Lucian M. Sprague, *Director*
International Center for
Marine Resource Development
University of Rhode Island
Kingston, R.I. 02881

UNIVERSITY PROGRAMS RELATED TO MARINE RESOURCE DEVELOPMENT

Graduate School of Oceanography

While all aspects of oceanography are represented, 11 members of the faculty are involved in various phases of biological oceanography including a program in aquaculture and fisheries. Areas of faculty interest are: general aquaculture, reproduction and rearing of larvae, genetics and selective breeding, and environmental techniques in algae culture.

The school grants the Master's degree and Ph.D. in oceanography with options in biological, chemical, geological, and physical oceanography.

Related activities at the Graduate School's Narragansett Bay Campus are the Rhode Island Nuclear Science Center's two megawatt research reactor; the Narragansett Marine Game Fish Research Laboratory, operated

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by the United States Bureau of Sport Fisheries and Wildlife; and the Northeast Water Hygiene Laboratory operated by the Public Health Service. A third facility, the National Marine Water Quality Laboratory of the federal Water Pollution Control Administration, will be constructed there. At present it is operating in a leased structure.

Resource Economics

The Department of Resource Economics in the College of Resource Development has developed strong competence in fisheries and marine economics research.

A Master of Science degree in food and resource economics is offered and a Ph.D. program with an option in marine resource economics in conjunction with the Department of Economics in the College of Arts and Sciences.

Food Technology

Work in food technology is spread through the Departments of Animal Science, Agricultural Chemistry, and Fisheries and Marine Technology in the College of Resource Development, and the Department of Food and Nutritional Science in the College of Home Economics.

The departments involved offer the Ph.D. in agricultural chemistry, and biochemistry; the M.S. degree in agricultural chemistry, animal science, and food and nutritional science. A coordinated research and graduate program stresses marine food and industrial feed production and development. The program is particularly strong in the industrial processing of fishery products for food and for feed for poultry and livestock.

Fisheries and Marine Technology

A faculty of six in the Department of Fisheries and Marine Technology in the College of Resource Development operates an unusual two-year associate degree program in commercial fisheries, and works on applied fisheries problems and fisheries extension activities.

The department provides a base of practical expertise in three important areas: education and training in commercial fisheries and marine technology; related extension activities; and development of new or underutilized fisheries resources.

Sociology and Anthropology

The Department of Sociology and Anthropology in the College of Arts and Sciences offers an M.A. degree.

Research strengths in the department are in social organization and demography and modernization, applied anthropology, and psychological anthropology. There is interest in applying the sociological-anthropological perspective toward problems of national development.

Economics

The Department of Economics in the College of Arts and Sciences offers a Master of Arts degree in Economics. A Ph.D. program with an option in marine economics is offered in conjunction with the Department of Resource Economics in the College of Resource Development.

Master of Marine Affairs Degree Program

The Marine Affairs Program, the first of its kind in the country, is designed primarily for persons who will be making decisions with respect to the use and control of the marine environment. Within the next few years, there is expected to be a growing demand for administrators, advisors, and researchers who have a broadly-based background in marine activities, and who can work in such areas as coastal zone management, marine law, industrial development, legislative counseling, and as advisors to foreign governments on marine activities.

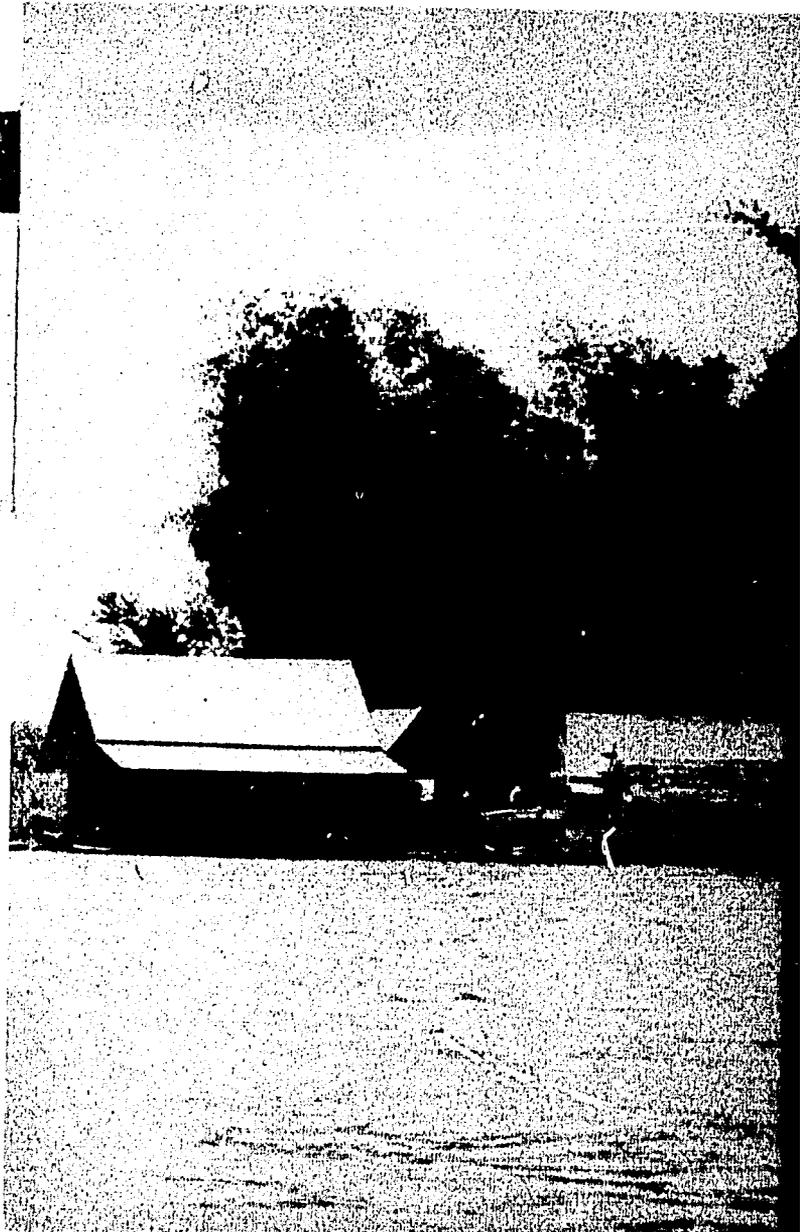
Ocean Engineering

The Department of Ocean Engineering in the College of Engineering offers the Ph.D. or the M.S. in ocean engineering, and in mechanical, chemical, electrical, industrial, and civil engineering with a minor in ocean engineering.

The ocean engineering faculty is equipped to deal with such projects as fishing-port development, including sediment control and waterfront construction, fish processing plant construction in terms of time and motion study and movement of materials, and plant design and pollution control in regions important to fishery resource protection.

The Law of the Sea Institute

The Law of the Sea Institute at the University of Rhode Island provides for the exchange of information and ideas concerning the control and use of the marine environment throughout the world. It holds annual summer conferences for an international group of specialists. This on-going program is the only one of its type in North America. The Institute publishes the proceedings of these conferences as well as an "Occasional Paper" series and a marine law and economics bibliography.



Top: Rio San Juan, Colombia
Middle: Songkhla, Thailand
Bottom: Rio Calima, Colombia
Cover: Kwai River, Thailand

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INTRODUCTION

The United States Foreign Assistance Act of 1966 was amended to include section 211(d), which provided funds for support of "research and educational institutions in the United States for the purpose of strengthening their capacities to develop and to carry out programs concerned with economic and social development of less developed countries".

Under the 211(d) provision of the Foreign Assistance Act, and with support from the Agency for International Development, the University of Rhode Island established the International Center for Marine Resource Development (ICMRD) in 1969, for the purpose of strengthening its research, training, consultation, and service capacities in marine resources, especially fisheries, and to expand current on-going University marine resource capabilities to an international dimension.

Given the magnitude and scope of the programs of other international agencies in the marine field, such as the Fisheries Division of the Food and Agriculture Organization of the United Nations (FAO), the World Bank, and the United Nations Development Programme (UNDP), it is clear to us that our program should be complementary and supportive of these other programs, and must, in order to be effective, emphasize person-to-person, or institution-to-institution development relationships. American universities provide an institutional framework in the field of international development designed to foster long-range research, graduate training programs and programs of faculty and student exchange, as well as corps of knowledgeable and concerned individuals of advanced technical capabilities.

Given the emphasis of the fisheries program of the FAO and the fishery-related programs of the various development banks which have financed a number of pre-investment and investment programs in the marine resource sector, it is clear, in a general way, that programs in the area of marine resources should concentrate their efforts toward clarification of economic and social issues, institution building and training, and technical assistance which can lead to sources of support for pre-investment and investment from bi-lateral and multi-lateral sources.

Teaching, research, and extension in marine related activities are of great importance to the University of Rhode Island and the development of the Center program is seen by us as a way of extending and modifying domestic research programs in terms of opportunities for needed research in the international dimension.

BACKGROUND

The 211(d) Grant: Some of the language of the grant may be useful in considering the material in later sections, **PLANS FOR THE FUTURE**, etc., and an abstract of the grant language is included here to focus attention on the purposes for which the University is developing this program.

The University of Rhode Island proposes to strengthen its research, teaching, consultation, and service capabilities in marine resources, especially fisheries, to expand current University marine resources capabilities to an international dimension. To accomplish this, an International Center for Development of Marine Resources (hereafter referred to as Center) will be established.

The Center will allow the University to direct to the problems of less developed nations its existing, planned, and proposed integrated strength in development economics, marine resource economics, marine biology, oceanography, ocean engineering, fisherman training, fishing gear research, food technology, marine resource extension work and supporting social science interest exemplified by the Law of the Sea Institute administered by the University.

Funds requested in this proposal will be used to engage present faculty to enlarge on their interests in international studies, to hire new faculty with these interests, to support domestic and foreign graduate and special students while they pursue their education or training in programs relevant to the purposes of this Grant, to improve library holdings, to help finance visiting lecturers for seminars, courses, and symposia and to provide for necessary supplies and travel related to this program.

The result will be an integrated multi-discipline Center with capabilities for identification of and consultation on the solution of economic, biological, technical, social, and institutional problems and constraints and the development and attainment of opportunities related to the role of marine resources in less developed countries. The work of the Center will be coordinated and integrated with and supported by the existing and expanding University activities in these subject areas on the state and national level.

The specific objectives of this Grant are as follows:

- 1) To conduct a series of multi-discipline studies dealing with the role of marine resources, particularly fisheries, in less developed countries;

- 2) To organize courses of study and seminars, inter-disciplinary where desirable in degree programs related to marine resources and their role in the food and nutritional needs and development programs of less developed countries;
- 3) To increase the capacity of the University to provide administrators and researchers in less developed countries with advanced, general, and specialized education in various aspects of marine resource utilization;
- 4) To provide training and educational opportunities for professional staff members of the Agency for International Development (AID), the Bureau of Commercial Fisheries, and other interested public and private agencies through short courses, symposia, and University course work;
- 5) To provide for the University's involvement in technical consultation and assistance and research on marine matters in less developed countries for AID and agencies of similar interest.

University Contributions (at time of proposal):

The University of Rhode Island currently receives approximately \$3,000,000 in state, federal, and private funding for the various aspects of marine resources research, teaching, extension, and consultation. This funding is expected to continue and to increase. Funds requested in this proposal will not replace existing funding for any programs. Also, activities provided for in this proposal will be additive to existing and planned programs at the University.

In addition to the University's broad base of support for marine resource studies, it will provide:

Office, classroom and auditorium space for faculty, students, and special meetings or symposia related to this program;

Library facilities at the main campus and at the Narragansett Bay Campus;

Appropriate access to University computer facilities and other special research aids such as research vessels and laboratories;

Consultation with members of the faculty not directly associated with the Center.

The University is committed to the continued growth and development of the Center. It regards the first five years as a basic development period during which time it would seek to enhance the financial backing both from

within the University and from other outside sources supporting international needs.

On submitting this proposal, the University makes an added commitment to attain such staff and research support growth during the next five years as to be able to continue the program indicated for the Center.

Objective and Scope of Proposed Program:

The program to be carried out under this Grant will build upon the existing and expected expansions in the broad-based marine resources activities at the University. The Grant will make it possible for the University to expand the on-going and expected domestic-oriented programs to an international level. This will be accomplished through a series of studies, courses, seminars, visiting lecturers, and an interchange of ideas and concepts with individuals in developing countries, in AID, and public and private agencies with similar interests.

The specific objectives of this program are:

- 1) To conduct a series of multi-discipline studies dealing with the role of marine resources, particularly fisheries, in less developed countries.
- 2) To organize courses of study and seminars, interdisciplinary where desirable, in degree programs related to marine resources and their role in the food and nutritional needs and development programs of less developed countries.
- 3) To increase the capacity of the University to provide administrators and researchers in less developed countries with advanced, general, and specialized education in various aspects of marine resource utilization.
- 4) To provide training and educational opportunities for professional staff members of the Agency for International Development (AID), the Bureau of Commercial Fisheries, and other interested public and private agencies through short courses, symposia, and University course work.
- 5) To provide for the University's involvement in technical consultation and assistance and research on marine matters in less developed countries for AID and agencies of similar interests.

From the basic background of information and expertise developed in carrying out the above four objectives, the University will be in a position to offer counsel and advice on proposed AID projects related to the fisheries and marine resources of less developed countries. Also,

under separate agreements or contracts, the University would have specialists available for technical assistance and team investigation in the various countries.

Organization and Policies of ICMRD: The ICMRD is organized under Dr. John A. Knauss, the Provost for Marine Affairs of the University of Rhode Island. Its Director, Dr. Lucian M. Sprague, was appointed on October 2, 1969. The activities of the ICMRD are correlated with on-going University programs through the office of the director and also by means of a Center Policy Committee, made up of representatives from a range of University programs.

The Chairman of the Policy Committee and the Director work closely to insure a continual multi-disciplinary focus to Center activities and to insure that appropriate emphasis is given to economic development research and analysis.

The Policy Committee of the ICMRD is composed of seven members of the University community. The Committee represents the multi-disciplinary scope of the Center. Members include:

Harlan C. Lampe - professor of food and resource economics; Chairman, ICMRD Policy Committee

Lewis M. Alexander - professor of geography; Director, Law of the Sea Institute

Nelson Marshall - professor of oceanography; member Governor's Technical Committee on the Rhode Island Coastal Zone

Aloys A. Michel - professor of geography; Associate Dean of Graduate School

Geoffrey A. Motte - assistant professor equivalent in fisheries and marine technology

Lawrence E. Ousterhout - associate professor of animal science

Lucian M. Sprague - Director, ICMRD

The Policy Committee has met formally and informally on many occasions to discuss policies, programs and objectives of the Center. Through its efforts, the Committee has formulated policy on such matters as financial assistance to research

projects and courses at the University of Rhode Island related to the Center's objectives; fellowship awards to qualified individuals on the post-graduate level; recruitment and appointment of staff and faculty; and travel and consultation services from Center staff to the developing countries and federal or international development agencies.

The Policy Committee has been particularly concerned with two avenues of research development: 1) the direct encouragement of research in marine resource development in areas that the Center feels are priority concerns, and 2) allowing for the development and growth of individual research interests to the dimension of international marine resource development problems.

To this end, the Policy Committee developed several programs. In the area of research, two kinds of aid are made available: 1) A fellowship to a graduate student pursuing a doctoral program in an area of specific interest to the Center and in direct support of its interests and activities, and 2) The support of faculty research upon the application of a faculty member for what are considered to be seed grants to promote research that fosters the purposes of the program. Research support to faculty members can include, but is not constrained to, research assistants, travel, supplies, and salary funds.

It is important to stress that, the competition for these research grants is University wide and does not distinguish between those faculty members who receive year round direct salary support from the Center and those who receive no direct salary support from the Center.

In the hiring of new faculty members, the Policy Committee maintains final control over an appointment made on

Center funds. As would be expected, the Center is necessarily involved with the departments in which members are appointed in reviewing promotion and salary considerations in ensuing years, insofar as such considerations relate to the provision and use of Center support. The Center has further established that individuals currently at the University may be supported by Center funds to their departments to obtain their "release time" and to enable the departments to release all or part of their time to the Center.

In addition, the Policy Committee has endorsed a program that will permit visiting faculty with special expertise in marine resource development to be brought to the University. Nominations for visiting faculty positions will be entertained from the faculty and others. The visiting faculty members will, where possible, have a department affiliation.

The Committee has further endorsed the policy that, given the magnitude of marine resource development problems, cooperation with other universities is both desirable and, in many instances, essential. To this end, the Director has already established informal relations with several universities and in time, formal working relations may develop as clear programs for compatible development can be established.

The Policy Committee has further argued that the establishment of relations with foreign universities concerned with marine resource development can be a continuing and most worthwhile activity for the Center and an active search is being conducted by the Director and Center faculty members for potential affiliations; at the present time, this effort is particularly with institutions in Southeast Asia and Latin America. In time, faculty and student exchanges with the cooperative institutions would be expected.

Perhaps the most critical question with which the Center has had to grapple is that of research development and capability development at the University and the need to extend this information and make special skills available in various parts of the world. The demands for individuals capable of evaluating fisheries development opportunities are extraordinarily large, but within the University structure, it is difficult to meet what are often very short time horizons and difficult to make faculty members available on this basis.

It will be, during the first few years of the program development, difficult to reconcile these needs because the problem essentially has as its solution a larger number of faculty members available to the rest of the world. Until we have increased our sources of support and the number of individuals involved in international marine resource development, substantially, it will continue to be difficult to respond to the short term needs of governments and various institutions.

We are anxious to retain the prospective outlined in the contract which requires desirably that we develop our skills to a substantial level within the University. But, on the other hand, we recognize our responsibility to give assistance when and where required. This issue will without question present real conflicts during the next few years. Their immediate resolution is not likely.

University Commitment to Marine Programs: Before taking up future Center plans, etc., it might be useful to provide the University setting for Center activities.

More than 100 faculty members, one-seventh of the University faculty, are engaged in marine research, teaching, and extension, with an annual operating budget of approximately \$5 million, exclusive of physical facilities and maintenance.

Marine science at the University of Rhode Island is an orientation, a direction, and an emphasis. URI has a commitment to an effort in marine activities that is expressed in the cooperation and the interdependence of departments and personnel in many aspects of University education, research, and public service.

There are five marine degree programs offered at the University of Rhode Island. The URI Graduate School of Oceanography, located on the 120-acre Narragansett Bay campus about six miles from the main campus at Kingston, was established in 1961. It has about 30 faculty members and 100 graduate students, working on M.S. or Ph.D. degrees.

Subsequent to the first Sea Grant national conference sponsored by URI in 1965, and consonant with the Sea Grant philosophy of a coherent and balanced approach to marine affairs, four more marine degree programs have also been established at the University.

The College of Engineering has instituted a department of ocean engineering, one of the few in the country, which offers both M.S. and Ph.D. degrees. There are presently about 45 master's students and 30 doctoral students in ocean engineering. The department has 13 faculty members - three

full time and the rest on joint appointments with other departments.

A doctoral degree program in economics (marine resource option) is offered jointly by the Department of Resource Economics of the College of Resource Development, the Department of Economics in the College of Arts and Sciences, and the Department of Finance in the College of Business Administration. Fifteen students are presently enrolled in the program.

A Master of Marine Affairs program, the first of its kind in the country, is a multi-disciplinary effort of the departments of resource economics, geography, geology, ocean engineering, political science, and the Graduate School of Oceanography. It accepts a maximum of 20 students each year.

A graduate certificate in development studies is offered by a cooperative program sponsored by the departments of economics, geography, political science, and resource economics, and supported by the University's Planning Committee on International Studies and by the ICMRD.

In addition, nearly every scientific discipline at the University offers some marine specialization at the graduate level. There are approximately 300 graduate students involved in marine related programs at the University of Rhode Island.

At the undergraduate level, the department of fisheries and marine technology offers a two-year commercial fisheries program leading to an associate in science degree. About 30 students are presently enrolled.

Two all-university committees, appointed by the Provost

for Marine Affairs, help to develop and coordinate marine research at URI: one of the committees is for fisheries and the other is for coastal zone research. A third area, largely supported by Sea Grant, is marine pharmacology-pharmacognosy. Some major research projects undertaken at the University include a feasibility study of a proposed nuclear power plant at nearby Rome Point and attempts to develop mathematical systems models of Narragansett Bay.

In line with its origin as a land grant college and the fact that it was one of the first seven universities to receive an institutional grant from the national Sea Grant program, URI has a tradition for public services. Specifically, the University provides three marine advisory services.

The New England Marine Resources Information Program disseminates information on a regional basis, primarily through publications in such areas as aquaculture, water pollution, and coastal studies. A Marine Advisory Service Program provides field services in fisheries, marine economics, education, and coastal development and management.

Finally, the Law of the Sea Institute is a major communications agency dealing with marine law and policy. It is internationally recognized and esteemed as a non-political forum for discussion of the legal regime of the oceans. The Institute holds annual summer conferences, publishes occasional papers, serves as an information exchange for local marine jurisdictional problems, and supplements the Master of Marine Affairs Program.

Cooperating Center Faculty:

- Alexander, Lewis M. - Professor of Geography and Director of Law of the Sea Institute, Department of Geography
Chichester, Clinton O. - Professor of Resource Chemistry, Department of Agricultural Resource Chemistry
Cobble, James W. - Dean, College of Resource Development and Director of Agricultural Experiment Station
Constantinides, Spiros - Assistant Professor of Food and Nutritional Science, Department of Food & Nutritional Science
Dirlam, Joel B. - Professor of Economics, Department of Economics
Dymsza, Henry A. - Associate Professor and Chairman of Food and Nutritional Science, Department of Food and Nutritional Science
Gates, John M. - Assistant Professor of Food and Resource Economics, Department of Food and Resource Economics
Herrington, William C. - Adjunct Professor, Law of the Sea Institute
Holmsen, Andreas A. - Associate Professor of Food and Resource Economics, Department of Food and Resource Economics
Knauss, John A. - Provost for Marine Affairs and Dean, Graduate School of Oceanography
Lampe, Harlan C. - Professor of Food and Resource Economics, Department of Food and Resource Economics
Landberg, Leif - Instructor in Anthropology, Department of Sociology and Anthropology
Marshall, Nelson - Professor of Oceanography, Graduate School of Oceanography
Meade, Thomas - Associate Professor of Fisheries and Marine Technology, Department of Fisheries and Marine Technology
Michel, Aloys A. - Professor of Geography and Associate Dean of Graduate School
Middleton, Foster H. - Professor and Chairman of Ocean Engineering, Department of Ocean Engineering
Motte, Geoffrey A. - Assistant Professor Equivalent in Fisheries and Marine Technology, Department of Fisheries and Marine Technology
Norton, Virgil J. - Professor & Chairman of Food and Resource Economics, Department of Food and Resource Economics
Ousterhout, Lawrence E. - Associate Professor of Animal Science, Department of Animal Science
Poggie, John J., Jr. - Assistant Professor of Anthropology, Department of Sociology and Anthropology
Prakash, Vinod - Assistant Professor of Economics, Department of Economics
Rorholm, Niels - Professor of Food and Resource Economics, Department of Food and Resource Economics and Director of University Self-Study Committee

- Rosengren, William R. - Professor and Chairman of Sociology,
Department of Sociology and Anthropology
- Saila, Saul B. - Professor of Oceanography, Graduate School
of Oceanography
- Sainsbury, John C. - Associate Professor and Chairman of
Fisheries and Marine Technology, Department of Fisheries
and Marine Technology
- Sieburth, John - Professor of Oceanography, Graduate School
of Oceanography
- Sprague, Lucian M. - Professor of Oceanography and Director
of International Center for Marine Resource Development

PLANS FOR THE FUTURE

ICMRD Objectives: The specific objectives of the International Center for Marine Resource Development are:

- 1) To conduct a series of multi-discipline studies dealing with the role of marine resources, particularly fisheries, in less developed countries;
- 2) To organize courses of study and seminars where desirable in degree programs related to marine resources and their role in the food and nutritional needs and development programs of less developed countries;
- 3) To provide and establish a liaison with national and international educational, research, and grant institutions, and to develop and provide a mechanism for linkage with selected overseas institutions for the purpose of developing programs of student and faculty exchange and related insitutional development and purposes;
- 4) To provide for the University's involvement in technical consultation and assistance and research on marine matters in less developed countries for AID and agencies of similar interest;
- 5) To facilitate research by faculty and students through grants and assistantships in areas such as biology, food technology, economics, and sociology, and by creating an appropriate framework for interaction among the various disciplines;
- 6) To provide training and educational opportunities for professional staff members of AID, the Bureau of Commercial Fisheries, and other interested public and private agencies through short courses, symposia, and University course work;
- 7) To assist departments in the development of marine resource and development assistance curricula supported by adequate library facilities and research support;

- 8) To expand educational opportunities by bringing outstanding scholars in the many disciplines together to conduct seminars and to participate in symposia; to organize and publish symposia and individual works of scholars appropriate to development assistance;
- 9) To increase the capacity of the University to provide administrators and researchers in less developed countries with advanced, general, and specialized education in various aspects of marine resource utilization;
- 10) To create at the University of Rhode Island a flexible response capable of materially contributing to the complex needs of marine resource development.

Future Plans: Three major program areas for development have been identified as the focus of technical and research interests at the University. These are:

- 1) Economics research, analysis and planning, leading toward the fisheries and marine resource development and from this base, the economic development of coastal communities;
- 2) Marine foods in economic development; the food science, food technology, and nutrition of marine foods as they relate to economic and social development based on marine resources in less developed countries;
- 3) Program extension activities which would culminate in the establishment of working relations with multi-lateral development institutions and scholarly institutions in less developed countries;
- 4) Discussion and work plan (text follows).

Economics research: The economics research effort will focus its attention on general problems of world fisheries development under the headings of:

- a) international trade in marine products
- b) potential world fisheries development, considering

- the cost structure and policies of major fishing nations
- c) management and administrative frameworks within which fisheries can be organized and developed in the developing countries
 - d) the macroeconomic considerations and the economic impact of fisheries development in underdeveloped countries
 - e) the microeconomic considerations and the socio-economic impact of fisheries development, employment policy, anthropology, and rural sociology of various development strategies

Three specific areas where education and research in developing countries will be considered:

First, marketing in its most general sense, where economists have rarely considered the measurement of the market parameters and the potential for market development within countries which are attractive as research areas. Without extensive exploration of market phenomena and the development of in-country expertise in these matters, the ability of economists to contribute to fisheries development in less developed countries is sharply limited.

The second specific area of concern is that of policy development in fisheries. Economists and others have rarely evaluated alternative approaches to fisheries development once a resource base has been established. It is essential that such alternative approaches be included in the educational programs of economists from developing nations.

The third area for consideration is that of credit and finance for fisheries development. Recognizing that frequently the sources of investment of fisheries development come from governments, it is still of some consequence to consider the development of credit instruments in the private sector for fisheries development and these issues have rarely been explored.

The fourth area deals with the fact that while the coastal fisherman shares many common problems with his purely agrarian counterpart, he differs significantly from the small farmer in that his resource base is often a common property resource and he is seldom provided for in even the most socially far-reaching programs of land tenure reform and land re-distribution. Much more research is needed to identify economic, employment, and educational policies that will specifically improve the livelihood of the small fisherman and assure him an equitable economic role in his society.

The appointment of Dr. Leif Landberg as assistant professor of anthropology at the University of Rhode Island, effective September 1, 1970, will enable the University to develop, with Dr. Landberg's leadership, research and technical assistance programs in this area of interest. Emphasis will be placed on research leading in specific cultural settings to the creation of viable rural institutions which can provide appropriate means of access to existing, or new, sources of credit, markets, training, and education.

Marine foods in economic development: The potential economic impact of marine food technology has been remarkably neglected in the developing countries throughout the world. Major emphasis has been placed on the increase in agricultural production, but no significant inroads have been made toward the widespread preservation or modification of agricultural and fisheries products, the conversion of raw materials to foodstuffs, and the dietary patterns of the population. Significant economic benefits are expected to emerge solely from the ability to reduce the enormous waste that occurs in the transfer of marine foods from production to consumption. Dr. Chichester, with extensive experience in the problems of the developing world, will lead our

University's efforts in this area.

Program extension: Two related areas of extension are of particular concern to us. The first, is the establishment of working relationships with overseas universities or research institutes. Ways need to be developed under our program to assist these institutions in developing their educational programs relating to marine resource development, bringing staff to the United States for interaction with our staff, primarily in order to develop a greater appreciation on our part of the real problems to be researched.

The second and as a part of these efforts, studies conducted for multi-lateral development agencies will be increasingly developed and used to: 1) conserve Center funds by providing support related to such studies, and 2) carry out such studies, under Center auspices, only if they contribute to Center objectives. Such efforts are seen as an excellent opportunity to gain valuable experience capable of being translated directly into our graduate teaching and research programs.

Such experience is also a way of confronting the real problems of socio-economic development in ways which will lead to a more precise definition of significant research. In some cases, such studies will also lead to the identification of overseas institutions with whom cooperative programs may be established.

Given the diversity of biological and social environments in the developing world, there are no substitutes for in-country experience in defining the general and specific focus of problem identification and in establishing research priorities.

Discussion and work plan: Support from AID will be used in the fiscal year 1971 to encourage faculty members to enlarge their interests in international studies and to expand on-going domestic programs to an international level. During the course of this year, there will be six graduate students, four of whom are pursuing doctoral programs, whose major concerns will be international marine resource development. Three of these graduate students have had prior international experience with federal agencies or the Peace Corps. Two foreign undergraduate students from Latin America are also pursuing their studies at the masters level. Four faculty members in the Department of Resource Economics (Harlan Lampe, Virgil Norton, Andreas Holmsen, and John Gates) have committed themselves to substantial activity in international marine resource development during the course of the next year. Two of these faculty members have had recent international experience in fishery development programs and research relating thereto. In Fisheries and Marine Technology, one faculty member (Thomas Meade) has made himself available for mission work during the course of next year in Latin America, where he will spend three months.

One of the graduate students in Resource Economics will assist Dr. L. Sprague in a research program to outline and define the social, economic, and institutional constraints which operate to retard, waste, or develop uneconomically, fisheries resources. Materials developed on missions for the World Bank will be used as a primary source and attempts will be made to improve our ability to carry out such reviews and to provide resource review models for fisheries.

Two anthropologists (Leif Landberg and John Poggie) will devote considerable effort during the course of this year to marine studies. One will concern himself with the international problems and another will begin to develop techniques

for evaluating the structure of fishing villages by working in the United States. Both of these men have had extensive international experience, one in assaying fisheries development problems in Africa, and the other evaluating the impact of technical change in Latin America.

In food technology, in addition to Dr. Chichester's program, one faculty member (Spiros Constantinides) will devote his attention to problems relating to processing and handling of shrimp in tropical climates.

In oceanography, one faculty member (John Sieburth) will supervise research in the culture and development of seaweeds as a potential resource for underdeveloped countries.

A new course will be offered by the Department of Resource Economics (Harlan Lampe, RE 430) which will deal with problems of international economic development as it relates to uses of the coastal zone and marine resources. This course will be offered at the graduate level for candidates for masters, or Ph.D.'s, and a supporting course in Economics (Vinod Prakash, ECON 566) dealing with general growth and development problems is being extensively revised this year to form a more satisfactory basis upon which to deal with marine resources.

The Departments of Economics, Resource Economics, Geography, and Political Science have developed a Graduate Certificate Program in Development Studies to serve as an adjunct to an M.A. or M.S. degree. To promote courses or relevance to Center objectives, the ICMRD will make funds available in the amount of \$2500 per annum in support of Economics 266 (ECON 566), to be offered at the University of Rhode Island in the spring of 1971.

An active search for additional staff in the Department of Resource Economics is being carried out. It is hoped that one additional staff member may join the department by spring of 1971.

To acquaint the University community and to offer opportunity for expanding knowledge concerning international development problems, the Center will, during the year, sponsor a series of week-long visits by recognized experts in the field of international development and marine resource problems. During these week long sessions, individual faculty members will have ample opportunity to explore new ideas with the visitors and the visitors will, as well, present several seminars to the faculty and to the general University body. These developments represent the substantial growth in the interests and performance of the University relating to international marine resource development.

An attempt will be made to define the needs for and the content of a traveling seminar series to be held in cooperation with the overseas missions and regional bureaus on the role of economic development of marine resources. If possible, one such seminar will be held in the summer of 1971. Such experiences will make it easier to relate the problems of the field to the participants teaching and research programs and will stimulate in individuals on our faculty an interest in and involvement with individuals and institutions overseas.

The visiting worker program and the fellowship program endorsed by the Policy Committee are detailed below:

The exchange of ideas in the area of marine resources and general development problems have been carried forward by our interdisciplinary seminar program. Applications are

being accepted to bring one or two distinguished workers to our campus per year with experience and a deep knowledge of the problems of economic and social development. The duration of such individuals' stay may vary, but in general, will not exceed one year. Participants will be expected to pursue scholarly work and interact with faculty and students to enrich their own and our experience.

A Center sponsored fellowship is now available for graduate study in the area of marine resource development. This fellowship is open to international students as well as United States citizens and will be awarded on the basis of excellence and relevance of their particular programs of graduate study to the purposes of the Center. Preference will be given to Ph.D. students with well-formed career plans, but all applicants will be required to submit a letter outlining a proposed graduate program and future career plans. Fellowships will be awarded and reviewed on an annual basis and normally will not be granted for a period greater than three years. Application must be made to the Graduate School for admission; and to the Center for fellowship support. Support for graduate assistantships must be arranged through the Center and the departments which are conducting Center related research programs.

ICMRD ACTIVITIES DURING FISCAL YEAR 1970

The first year of the Center has been primarily devoted to the definition of specific program objectives as set forth in PLANS FOR THE FUTURE, in policy making, and in recruitment of a director and staff for Center related departments. Curriculum vitae for Center appointments and for the Center Policy Committee are included in the Appendix of this report.

The Center was formally approved by the Agency for International Development in May of 1969 and was awarded a five year \$750,000 grant. The Center is the first of its type in the nation and is focusing its program initially on the problems of developing fishery resources in the underdeveloped countries.

Dr. Lucian M. Sprague, associate director of medical and natural science, the Rockefeller Foundation, was appointed Director of the Center, effective October 2, 1969. Prior to joining the Rockefeller Foundation, Dr. Sprague spent eleven years with the U. S. Bureau of Commercial Fisheries in both La Jolla, California and in Honolulu, Hawaii. In recent years, he has directed his work almost exclusively to the area of marine resource policy and development.

The office of the ICMRD is located at 19 Upper College Road on the University of Rhode Island campus in a building assigned to the Graduate School of Oceanography. Two rooms for office space were initially allocated for Center use and a technical assistant for international resource development was appointed on February 9, 1970.

Development of Teaching and Research Competence: In April of 1970, Dr. Clinton O. Chichester, an internationally

prominent food scientist with extensive international experience in Latin America, and a number of numerous national and international food and nutrition committees, was appointed professor of food and resource chemistry at the University, effective June 1, 1970. Dr. Chichester's appointment was made jointly by the College of Resource Development and the Center. In addition to his capital equipment, valued at over \$100,000, which will maintain his research and be available to the college, Dr. Chichester brought with him a number of grants and contracts, as well as several graduate students.

Mr Leif Landberg has been appointed to the University of Rhode Island as Instructor of Anthropology, effective July 1, 1970. Mr. Landberg has completed all requirements for his doctorate. His broad experience in development studies, as a foreign area fellow, working on economic anthropology in Tanzanian fishing villages in East Africa, his demonstrated research ability, and the fact that he has clearly chosen marine anthropology as his primary field of interest, indicate that he is an important and promising addition to the University's faculty and to the staff of the Center.

Research at the Graduate School of Oceanography includes the study of the importance of seaweed products released in the formation of microbial biomass and its role in the nutrition of developing larvae and zooplankton. This is crucial to an understanding of the food web. Professor John Sieburth is being given research support for one graduate student, Raja Seshadri, who is studying the seaweeds as the major source of marine yeasts. These organisms have proven nutritional value and are economically important in industry. He is making very satisfactory progress and is gaining information and skills which will make him very useful in the development of marine resources when he

returns to India after completing his Ph. D. in Oceanography. To support research in 1969-70, the ICMRD approved funds in the amount of \$4775. An appropriation of \$5125 will be approved for 1970-71 for the successful completion of this work.

In order to provide an opportunity for Professor Thomas M. Meade, associate professor of Fisheries and Marine Technology, to become more familiar with research problems in his area of interest, travel expenses were provided from ICMRD funds for his participation in the American Chemical Society National Meeting (Protein Symposium) held in New York in September, 1969. Support was also provided for his attendance at the Conference on the Sanitary Quality and Microbial Safety of Fishery Products Planning Meeting at the University of Puerto Rico in October, 1969, on behalf of the Center. These funds will result in his leading a technical assistance mission in Latin America for AID mission in 1971.

Dr. Saul B. Saila, professor of oceanography in the Graduate School of Oceanography, was supported by the ICMRD to participate in a preliminary reconnaissance and survey of Lake Izabel and vicinity in Guatemala on February 22-28, 1970. This survey was made in conjunction with the Center for Tropical Agriculture of the University of Florida. The purpose of the field trip was to define some of the fisheries related problems in the area with a view toward establishing formal collaboration with the University of Florida in the region. The first goal of the survey was to assess the problems and potential of the natural fishery of the Lake Izabel area. The second and long-term goal involved development of a program of aquaculture for the more valuable indigenous species and a preliminary assessment of the area as a location for a tropical aquaculture center.

Attention is drawn to the section in Future Plans which discusses the development of Economics 566 and Resource Economics 430.

Development of Competence for Consultation and Service:

In November of 1969, the Center provided support in the amount of \$900 to the Department of Food and Resource Economics. These funds were made available for Professor Lampe's work in the Dominican Republic as a project economist for the Inter-American Development Bank from October 1969 to January 1970. The basic objectives of this fisheries pre-development mission project were: 1) to provide additional animal protein to a population with extraordinarily low protein intake; 2) to provide improved opportunity to a marginally productive fishing industry; 3) to create a basis for the further economic and technical development of the fishing industry; and 4) to provide substitutes for imported fish that require significant foreign exchange. To achieve these objectives, the mission proposed the organization of six cooperative fishing bases in the country with a central marketing and administrative headquarters in the capital city. An important aspect of the project is the massive technical assistance component. Technical aid in fishing, management, and processing will be intensive during the first year and continue at a reduced level during the first three years of operation. The project was not focused on the development of an industrial fishery complex, but rather on a level where technical and management skills can be carefully developed and where the fishermen and their institutions can become an important part of the economic and social environment of the community and the country.

From March 30 through April 28, 1970, the International Bank for Reconstruction and Development (IBRD), Agricultural

Projects Department, engaged the services of Dr. Sprague to participate in an agricultural sector review mission to Iran. Dr. Sprague's particular area of consultation in this mission related to fisheries. The Bank provided travel and living expenses, and reimbursed the University for his services. Dr. Sprague's completed report - Agricultural Sector Review of Iran; Fisheries, June 1970, will be published by the IBRD as a fisheries annex to the Iran Mission Report. The report details the present and potential harvest, and investment potential of Iranian fisheries in the Caspian Sea, the inland waters, and the Persian Gulf.

In addition, the report also details the present facilities for harvesting, processing and marketing the catch and details steps needed to increase the economic benefits from present and potential resources. Included in the report is a comprehensive plan for the development of the Persian Gulf fisheries including recommendations for improved management of the resources, administration of the fisheries, processing of the catch, and needed governmental arrangements for marketing, credit, training, and research.

Involvement of Other University Resources: Besides physical facilities, the University has provided the costs of the Policy Committee and salary support for Professors Saila, Meade, Norton, and Lampe, during short assignments on behalf of the Center. Interaction between developing Center activities and other established and new programs at the University is beginning to develop. Working relations with a variety of departments and programs are developing and are expected to accelerate in the coming year.

For example, the University provided substantial consulting in regard to the following activities in cooperation with Center staff:

Mr. M. Crouzet of the International Basic Economy Corporation (IBEC), visited the University for the purpose of discussing with the faculty of the Department of Resource Economics the market potential for aquacultural products produced in Latin American countries in which the Corporation has an interest. One of Mr. Crouzet's staff made a follow-up visit to discuss the particulars of this program.

Dr. R. Lima, who operates a private medical school in Vitoria, Espirito Santo, Brazil, visited the University with representatives of Partners in the Alliance. His visit was designed to permit an evaluation by the faculty of his plans to develop a fishermen's training school and a marine biological station at Guarapari, E. S., Brazil. A preliminary evaluation was presented to Dr. Lima in October, 1970.

Other Center related activities include the following:

The Rockefeller Foundation appointed the Director of the Center as consultant to the Foundation's program in medical and natural sciences during the year beginning January 1, 1970. The purpose of these arrangements is to enable the appointee to make short-term visits to marine resource projects in Asia and Latin America, as required, on behalf of the Foundation.

The Third Meeting of the Council of the Southeast Asian Fisheries Development Center (SEAFDEC) was held in Tokyo, Japan, on December 10-12, 1969. The Director of the Center was in attendance at this meeting, serving in the capacity of technical representative from the Indo-Pacific Fisheries Council (IPFC). SEAFDEC is in part supported by regional AID program funds and its activities are sufficiently similar to the efforts of the Department of Fisheries and Marine

Technology in fisheries training, that future cooperative programs are being considered.

At FAO expense, the Director of the Center participated as convenor and chairman of the FAO/IPFC Working Party on Coastal Aquaculture, held in Bangkok, Thailand, on December 15-17, 1969. The position of convenor and chairman of the IPFC Symposium on Coastal Aquaculture, to be held in Bangkok later this year, was also accepted by the Director of the Center. The objectives of the working party and the symposium are to review the present status of coastal zone aquaculture in brackish and marine waters of the Indo-Pacific region in all of its aspects; technical, scientific, and economic. An attempt also will be made to submit present and obtain future information in a form suitable for policy decision leading to national and international actions needed to utilize natural, economic and human resources within the region for the benefit of its inhabitants.

Dr. Andreas Holmsen of the Department of Food and Resource Economics was on a leave of absence in fiscal year 1970 from the University of Rhode Island to serve with FAO in a survey investigating the operating costs of vessel design for food fisheries in Peru. This mission was begun in October of 1969 and will continue through September of 1970.

Dr. Saul B. Saila, on sabbatical from July 1, 1970 through June 30, 1971, is currently working with the Inter-Governmental Oceanographic Commission of UNESCO in Paris. Dr. Saila will be concerned primarily with the area of marine pollution and the long-range and expanded program for ocean research, the ten-year international LEPOR program.

On June 8-10, 1970, Mr. Hubert E. Wood, Director of Fisheries in Trinidad and Tobago, visited the Center to discuss possible cooperative programs, especially in the area of fisheries, between the Center and the government of Trinidad and Tobago.

The FAO Second World Food Congress, held in the Hague from June 16 through 30, 1970, was attended by Dr. Sprague, with ICMRD support.

The National Research Council of the National Academy of Sciences has appointed Dr. Sprague to the subcommittee on Aquatic Animal Health, Committee on Animal Health, Agricultural Board, for a term ending in June of 1971. This appointment was an extension of Dr. Sprague's participation as a member of the ad hoc task force on aquatic animal health, Committee on Animal Health, National Academy of Sciences. This task force is responsible for the report: Food From the Seas, still in draft form. Dr. Sprague is also a member of the National Academy of Sciences Committee on Oceanography, Ocean Manpower Panel.

The Center is represented on the Association of United States University Directors of International Agricultural Programs by the director.

The ICMRD also has held brief technical assistance exploration contact, or provided advisory services, with various AID branches, the Bureau of Southeast Asia, the Technical Assistance Bureau of AID, and the United States Embassy in Thailand.

BUDGET EXPENDITURES FOR FISCAL YEAR 1970

Expenditures for Fiscal Year 1970:

Salaries:		
Director, Lucian Sprague	\$	22,543
Technical Assistant, Deedra Durocher		3,684
Fringe Benefits		
		2,832
Travel:		
Domestic		573
International*		1,317
Research Support		
		4,775
Grants-In-Aid		
		900
Consultants		
		250
Supplies		
		184
Equipment*		
		1,037
Communications		
		157
Other (Includes postage, copying, library purchases, printing, hotel accommodations for official visitors, services required, honorarium, and miscellaneous charges)		
		1,364
<hr/>		
TOTAL	\$	39,616

*See detailed breakdown on following pages

International travel breakdown:

Dr. Lucian Sprague; Tokyo, Japan

December 10-12, 1969

To attend Third Meeting of the
Council of the Southeast Asian
Fisheries Development Center
(SEAFDEC)

Cooperative programs with SEAFDEC
may result from Dr. Sprague's
participation in this meeting

Total Cost \$ 85.65

Dr. Saul B. Saila; Guatemala (Lake
Izabel and vicinity)

February 22-28, 1970

To participate in reconnaissance
and survey of Lake Izabel and vicinity
in conjunction with Center for Tropical
Agriculture of the University of Florida

Possible collaboration with the University
of Florida in the region in the area of
fisheries and related problems may develop

Total Cost \$ 521.82

Dr. Lucian Sprague; The Hague

June 16-30, 1970

To participate in the FAO Second
World Food Congress

To broaden and deepen knowledge of the
world's food problems and the efforts
and research being carried out or pro-
posed to combat them

Total Cost \$ 709.27

TOTAL

\$1,316.74

Equipment breakdown:

IBM #224 Portable (Dictating Machine)
with carrying case (1)

International Business Machines
Boston, Massachusetts

Total Cost \$ 425.00

IBM #233 Combination (Transcribing)
Unit, with foot pedal and
headset (1)

International Business Machines
Boston, Massachusetts

Total Cost \$ 484.00

U.R.I. Seal Wooden Arm Chairs (6)

Nichols and Stone
Gardner, Massachusetts

Total Cost \$ 128.00

Purpose for all above equipment:

To complete equipping the office of
the Director for operation

TOTAL \$ 1,037.00

BUDGET SUMMARY

Please refer to Discussion and work plan section of text (pg. 20) for narrative.

Budget summary shown on following double page.

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	<u>1970</u>
Salaries:	
Director, L. Sprague	\$ 22,543
Technical Assistant, D. Durocher	3,684
Clerical Assistant	
Prof. Resource Chemistry, C. Chichester	
Assist. Prof. Anthropology, L. Landberg	
Additional Faculty, Dept. Resource Economics	
Additional Faculty, Dept. Resource Economics	
Additional Faculty, Dept. Political Science	
Fringe Benefits	2,832
Travel:	
Domestic	573
International	1,317
Research Support:	
Dr. C. Chichester	
Dr. L. Landberg	
Dr. J. Sieburth	4,775
Dr. L. Sprague	
Dr. S. Constantinides	
Anticipated Requests (Dept. Resource Economics, Dept. Political Science)	
Grant-In-Aid:	
Dept. of Economics for teaching in Development Studies Program	
Dept. of Resource Economics (H. Lampe)	900
ICMRD Fellowship	
	<hr/>
SUB-TOTAL	\$ 36,624

<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
\$ 26,924	\$ 28,400	\$ 29,000	\$ 30,000
6,205	7,000	7,400	7,600
3,100	3,500	3,700	3,800
20,000	20,000	20,000	20,000
12,742	14,000	14,700	15,500
15,000	15,750	16,000	16,500
7,000	7,200	16,000	16,500
			15,000
9,825	10,352	11,534	13,489
1,000	1,000	1,000	1,000
5,000	5,000	5,000	5,000
5,000	5,000	5,000	--
3,000	3,000	3,000	--
5,125	--	--	--
5,000	5,000	5,000	5,000
5,000	5,000	2,500	--
3,000	5,000	8,000	18,000
2,500	2,500	2,500	--
--	--	--	--
	8,000	8,000	8,000
<hr/>	<hr/>	<hr/>	<hr/>
\$ 135,421	\$ 145,702	\$ 158,334	\$ 175,389

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	<u>1970</u>
SUB-TOTAL	\$ 36,624
Field Workshop on Marine Resource Development	
Visiting Faculty	
Visiting Lecture Series	
Supplies	184
Equipment	1,037
Publications	
Communications	157
Production of Reports	
Reprints to Agency	
Consultants	250
Other	1,364
Contingency	
SUB-TOTAL	\$ <u>39,616</u>
Receipts for Services	-4,256
TOTAL	\$ <u>35,360</u>

<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
\$ 135,421	\$ 145,702	\$ 158,334	\$ 175,389
	10,000	--	--
	15,000	15,000	15,000
5,000	5,000	5,000	5,000
500	1,000	1,400	1,600
1,000	1,000	1,000	1,000
1,000	1,000	1,000	1,000
500	700	900	1,000
650	650	650	650
500	500	500	500
500	500	--	--
--	--	--	--
			3,594
<u>\$ 145,071</u>	<u>\$ 181,052</u>	<u>\$ 183,784</u>	<u>\$ 204,733</u>
<u>\$ 145,071</u>	<u>\$ 181,052</u>	<u>\$ 183,784</u>	<u>\$ 204,733</u>

TOTAL GRANT \$750,000

APPENDIX

NAME: Lucian M. Sprague

BIRTH [REDACTED]

EDUCATION:

A.B. 1950 University of California, Santa Barbara.
Social Sciences
Ph.D. 1957 University of California, Davis. Genetics
1966-1967 U. S. Government Fellow, Institute for
Human Genetics, University of Uppsala,
Uppsala, Sweden

PROFESSIONAL SOCIETIES:

Fellow AAAS; Sigma XI; American Institute for Fishery
Research Biologists; Genetics Society of America;
American Academy of Arts and Sciences; Gulf and Caribbean
Fisheries Institute; Association of U. S. Directors of
International Agricultural Programs; New York Academy of Sciences.

OTHER PROFESSIONAL ACTIVITIES:

Consultant, editor, author, or co-author of study team
or field survey reports to:

U. S. Civil Administration of Ryukyu Islands,
Fisheries-Oceanography Research in the Ryukyu Islands, 1964;

U. S. Bureau of Commercial Fisheries, The Norwegian
Method of Purse Seining And Its Application to Central
Pacific Fisheries, 1966;

National Academy of Sciences, U. S. and National Science
Development Board, Philippines, "Research" in Proceedings
Philippines-U.S. Workshop on Fisheries Oceanography, 1967;

The Universidad del Valle, Cali, Colombia, Academic
and Economic Opportunities in the Region of the Bahia
de Malaga, 1968;

Report to the International Programs Office, University
of Florida, on Aquatic Sciences at the University of
Florida, 1969;

International Bank for Reconstruction and Development,
Agricultural Sector Review of Iran: Fisheries, 1970;
The Rockefeller Foundation, consultant 1970-1971.

Convenor and Chairman of:

IPFC Working Party on Coastal Aquaculture, Bangkok, 1969
IPFC Symposium on Coastal Aquaculture, Bangkok, 1970

Member:

National Academy of Sciences Committee on Oceanography,
Ocean Manpower Data Panel, 1969-; Hawaii State Governors'
Committee on Science and Technology, 1963-1965; FAO Expert
Panel for the Facilitation of Tuna Research, 1964; Sub-
committee on Aquatic Animal Health, Committee on Animal
Health, National Academy of Sciences. 1970-

EMPLOYMENT:

University of Rhode Island, Graduate School of Oceanography, Professor of Oceanography and Director of the International Center for Marine Resource Development, 1969-;

The Rockefeller Foundation, Associate Director for Medical and Natural Sciences, 1967-1969;

U. S. Bureau of Commercial Fisheries, Honolulu, Hawaii, Deputy Area Director, 1962-1967; (Acting Area Director during Director's absence on Guggenheim Fellowship, 1963-1964); Chief, Subpopulations Program 1960-1962;

U. S. Bureau of Commercial Fisheries, La Jolla, California, Chief, Subpopulations Program, 1956-1960.

EXPERIENCE:

Three years experience with the California Sardine industry as part of a government-University-industry effort, the California Cooperative Fisheries Investigations;

Seven years experience with all aspects of Central and Western Pacific tuna fisheries;

Two years experience examining the critical problems of South East Asian fishery development, particularly the fresh and brackish water inland and coastal zone fisheries, government organizations, and University programs of relevance to these problems.

PUBLICATIONS: (representative titles from more than 15 scientific articles)

1953. Cushing, John E., and Lucian M. Sprague. Agglutinations of the Erythrocytes of Various Fish by Human and Other Sera. *American Naturalist*, volume 836, pp. 307-316.

1958. Sprague, Lucian M. On the Distribution and Inheritance of a Natural Antibody in Cattle. *Genetics*, volume 43, number 6, pp. 913-918.

1962. Sprague, Lucian M. Studies of the Erythrocyte Antigens of the Skipjack Tuna (*Katsuwonus pelamis*). *The American Naturalist*, July-Aug. 1962, volume XCVI, number 889, pp. 233-238.

1962. Sprague, Lucian M., and Andrew M. Vrooman. A Racial Analysis of the Pacific Sardine (*Sardinops caerulea*) Based on Studies of Erythrocyte Antigens. *Annals of the New York Academy of Sciences*, volume 97, article 1, pp. 131-138.

1967. Sprague, Lucian M. Multiple Molecular Forms of Serum Esterase in Three Tuna Species From the Pacific Ocean. *Hereditas*, 57: 198-204.

1970. Sprague, Lucian M. The Potential For Brackish Water Culture Along the Gulf of Thailand. *Proceedings-Food and Drugs From the Sea*, 1969, pp. 93-101.

MS. Genetics and the Study of Subpopulations of Fishes (for FAO).

MS. Resource Ecology. (Tentative title for Bulletin of Atomic Scientists).

NAME: Clinton O. Chichester

EDUCATION:

B.S. 1949 Massachusetts Institute of Technology, Cambridge, Mass
Chemical Engineering
M.S. 1951 University of California, Berkeley. Food Science
Ph.D. 1954 University of California, Berkeley. Agric. Chemistry

PRESENT EMPLOYMENT:

University of Rhode Island, Professor of Food and Resource
Chemistry

PROFESSIONAL SOCIETIES:

American Chemical Society; Institute of Food Technologists;
Society of Experimental Stress Analysis; Association of
Automotive Medicine; New York Academy of Sciences, Spectro-
scopy Society; American Society of Biological Chemistry;
American Institute of Nutrition; American Public Health
Association; American Optical Society; American Institute
of Chemical Engineers; American Medical Association;
American Society of Clinical Nutrition.

SERVING ON COMMITTEES:

Institute of Food Technologists: Committee on Training;
International Award Jury; Committee on World Food Programs;
Executive Committee, Northern California Section; Organizing
Committee for III International Congress of Food Science and
Technology; Subcommittee on Scholarships and Awards;
American Standards Association: Committee on Vehicular
Head Protection
National Academy of Sciences: Committee on Research in
Life Sciences (Panel 22); Chairman, Committee on Nutrition
in Space; Committee on Space Medicine; Committee on Space
Biology; Panel on Waste Management; Committee on Biological
Experimentation on Gemini and Apollo; Committee on Marine
Protein Resources, Food Protection Committee; Chairman,
Food Technology Subcommittee of Food Protection Committee;
National Institutes of Health: Chairman, Environmental
Biology and Chemistry Study Section; Planning Committee of
Environmental Biology and Chemistry Study Section; Committee
on Training in Environmental Health;
Nutrition Section-Office of International Research(NIH):
Steering Committee in Agriculture; Organizing Committee;
Consultant on Bolivian Nutrition Survey, Guatemalan
Nutritional Survey; El Salvador Nutrition Survey;
Paraguayan Nutrition Survey; and Colombian Nutrition Survey
International Standards Organization: U. S Representative
on Z-90 Committee
American Medical Association: Council on Foods and Nutrition;
Vice-president of Council on Foods and Nutrition; Chairman,
Food Sciences Committee; Committee on 3rd Western Hemisphere
Conference on Nutrition;

American Public Health Association: Committee on Programs,
Section on Food and Nutrition;
Meals for Millions: Consultant on Fish Protein Concentrate;
Advanced Research Projects Agency; Consultant on Army Rations;
Phi Tau Sigma (Journal): Editorial Board, Food Scientist;
Snell Memorial Foundation: President
Agency for International Development: Consultant on Fish
Protein Concentrate
American Society of Mechanical Engineers: Food Machinery
Committee;
Caribbean Research Laboratories; Board of Directors.

PUBLICATIONS:

Senior Editor, Advances in Food Research, which is now in
the 18th volume.

Editor, together with E. M. Mrak and G. F. Stewart, of
Monographs in Food Science and Technology.

Author of approximately 200 papers over the last fifteen
years on Chemistry and Engineering in Food Science.

AWARDS:

Bernardo O'Higgins Award from the Government of Chile
for work on the nutrition of children

National Academy of Czechoslovakia Gold Medal for work
on nutrition of children

Ministry of Agriculture (Czech.) Gold Medal for work
on Mallard Rx

NAME: Leif C. W. Landberg

BIRTH:

EDUCATION: A.B. University of California, Los Angeles, 1960
M.A. University of Arizona, 1963
Advanced to Ph.D. Candidacy, University of California, Davis, 1967
Ph.C. (Candidate in Philosophy) University of California, Davis, 1969

EMPLOYMENT: 1961-63 Teaching Assistant, Anthropology, University of Arizona
1965-66 Teaching Assistant, Anthropology, University of California, Davis
1966-67 Associate in Anthropology, University of California, Davis
1970- Instructor in Anthropology, University of Rhode Island

PROFESSIONAL SOCIETIES AND ACTIVITIES:
Member: Sigma Si; American Anthropological Association; Royal Anthropological Institute; International African Institute; African Studies Association (USA); The Tanzania Society
Other: Contributing Editor, Annual Report, Archaeological Survey, Vol.8 (1966), Dept. of Anthropology, Univ. of California, L.A.; Panel discussant for "Post-1800 Historic Sites", International Conference on Historic Archaeology, 1967, Dallas; Lecturer on Aboriginal Cultural Ecology seminar, Dept. of Anthropology, San Fernando State College, Calif., 1967; Lecturer on African languages and the anthropological meaning of race, with special reference to Africa, Temple City Intercultural Curriculum Workshop, Los Angeles, Calif., 1967.

EXPERIENCE: One and one half years of social anthropological field investigations in a Swahili-speaking fishing community on the norther coast of Tanzania, East Africa, Feb. 1968-Nov. 1969. Research includes social survey and census of fishing village; place of fishing in total economy of village and region, etc.

PUBLICATIONS: Various papers presented
1966 Tuna Tagging and the Extra-Oceanic Distribution of Curved, Single-piece Shell Fishhooks. American Antiquity, Vol.31, No.4, pp. 485-493.
1968 Comments and Addenda on Tuna Tagging and Shell Fishhooks. American Antiquity, Vol.33, No.1, pp.98-100.
MS. A Marine-Oriented Ecological Interpretation of the Aboriginal Settlement Patters of San Nicolas Island, California.

NAME: Lewis M. Alexander
 BIRTH: [REDACTED] [REDACTED] [REDACTED]
 EDUCATION: A.B. Middlebury College, 1942
 M.A. Clark University, 1948
 Ph.D. Clark University, 1949

EMPLOYMENT: 1949-50 Instructor in Geography, Hunter College
 1950-60 Assistant and Associate Professor of
 Geography, Harpur College, State Univ. of New York
 1960-65 Professor of Geography, Univ. of Rhode Island
 1965- Director of Law of the Sea Institute, URI
 1967-68 Deputy Director, President's Commission on
 Marine Science, Engineering & Resources.
 1969- Director, Master of Marine Affairs Program, URI
 1970- Chairman, Department of Geography, URI

PROFESSIONAL SOCIETIES AND ACTIVITIES:

Member: Association of American Geographers; American
 Geographical Society; Marine Technology Society;
 American Society of International Law; Phi Kappa Phi;
 Consultant: U. S. Department of State (since 1963);
 Fellow: Mershon Social Science Program, 1966-67;
 Consultant: National Science Foundation; National
 Council on Marine Resources and Engineering De-
 velopment;
 Other: Secretary, Commission to Study, Establish, and
 Claim for the State of Rhode Island Its Rights in
 Offshore Coastal Waters; participant, Advisory
 Panel for Sea Grant Projects.

PUBLICATIONS: Total number over 40

1967 The Law of the Sea: Offshore Boundaries and Zones,
 (ed.) Ohio State University Press.
 1967 The Northeast: Tradition and Change, Van Nostrand
 1968 The Law of the Sea: The Future of the Sea's Resources,
 (ed.) University of Rhode Island Press
 1968 National Jurisdiction in the Use of the Sea, Natural
 Resources Journal, Vol.4.
 1968 Geography and the Law of the Sea, Annals of the
 Association of American Geographers, Vol. 58
 1969 The Law of the Sea: National Policy Recommendations
 (ed.) University of Rhode Island Press.

NAME: Harlan C. Lampe
BIRTH: [REDACTED] [REDACTED] [REDACTED]
EDUCATION: B.S. University of Minnesota, 1949
Graduate Study, Agric. Economics, 1951-54

EMPLOYMENT: 1954-55 Instructor, Univ. of Minnesota
1956-59 Assistant Professor, Univ. of Connecticut
1959-61 Assistant Professor, Univ. of Rhode Island
1961-67 Associate Professor, Univ. of Rhode Island
1968 Senior Economist, National Research Council
of Canada
1968- Associate Professor, Univ. of Rhode Island

PROFESSIONAL ACTIVITIES AND SOCIETIES:
Member: Advisory Commite for Fisheries, Atlantic
Development Board; Marine Resources Program
Committee, 1961-67; Fishermen's Forum Program
Committee, 1961-64; Committee of Co-operating
Institutions of the MIT Computation Center, 1961-64;
Acting Director, Computer Laboratory, URI, 1964
Chairman, Northeast U.S. Technical Committee on
Fishery Marketing Research, 1966

PUBLICATIONS: Total number over 20
1967 with N. Rorholm, N. Marshall, and J. Farrell,
Economic Impact of Marine Oriented Activities-
A Study of the Southern New England Marine Region,
Economics of Marine Resources Bulletin #7, URI
1968 A Red Herring and Some Myths About Fisheries Con-
servation, Rhode Island Agriculture, Vol. 14, No.1

NAME: Nelson Marshall
 BIRTH: [REDACTED]
 EDUCATION: B.S. Rollins College, 1937
 M.S. Ohio State University, 1941
 Ph.D. University of Florida, 1941
 Postdoctorate Fellow - Woods Hole Oceanographic
 Institution, summers, 1963-64

EMPLOYMENT: 1941-45 Instructor and Assistant professor of
 zoology, University of Connecticut
 1945-46 Assistant professor in zoology and marine
 lab, University of Miami
 1946-47 Associate professor of zoology, University
 of North Carolina
 1947-51 Director, Virginia Institute of Marine Science,
 Professor of biology, College of William and Mary
 1952-53 Associate director, Oceanography Institute,
 Florida State University
 1954-55 Visiting investigator, Bingham Oceanographic
 Lab., Yale University
 1955-59 Dean, College of Liberal Arts, Alfred University
 1959- Professor of oceanography, Graduate School of
 Oceanography, Univ. of Rhode Island (Dean, Summer
 session 1959-61)

PROFESSIONAL ACTIVITIES AND SOCIETIES:

Member: Sigma Xi; Phi Sigma; Atlantic Estuarine
 Research Society (honorary); American Association
 for the Advancement of Science; Executive committee
 of Master of Marine Affairs, URI; Committee on
 Marine Resources and on Coastal Zone Studies, URI;
 Chairman, New England Interstate Water Pollution
 Control Commission; Governor's Technical Committee
 on R. I. Coastal Zone; Chesapeake Bay Committee of
 Smithsonian Institute; Board of Trustees of Rollins
 College (honorary); founding Executive Committee of
 Chesapeake Bay Institute

Consultant: formerly for Marine Sciences for Southern
 Regional Education Board; Millstone and Northeast
 Utilities Service Company; Review of misc. proposals
 for AEC, NSF, and American Scandinavian Foundation;
 research travel includes Eniwetok Atoll, Caribbean
 and Bahamas areas.

PUBLICATIONS: Total number - over 60

1966 Mortality Rates and the Life Span of the Bay Scallop,
Acquiptecten irradians. Proceedings, National Shellfish
 Association, Vol. 54, pp. 87-92.

1967 with F. W. Hatfield and D. M. Skauen. Grass Beta
 Activity in Fucus hybrids (rockweed) From the Niantic
 Estuary, Connecticut 1961-64. Radiol. Health Data and
 Reports, August, pp. 481-483.

1967 with J. K. Moore. The Retention of Lamellibranch
 Larvae in the Niantic Estuary. The Voliger, Vol. 10,
 pp. 10-12.

NAME: Aloys A. Michel
 BIRTH: [REDACTED]
 EDUCATION: A.B. Harvard University, 1950
 M.B.A. Columbia University, 1953
 Ph.D. Columbia University, 1959

EMPLOYMENT: 1956-57 Instructor in Geography, Columbia University
 1957-58 Foreign field research program project in
 Afghanistan (National Academy of Sciences, NRC)
 1958-59 Instructor in Geography, Yale University
 1959-65 Assistant professor of Geography, Yale Univ.
 1965-66 Associate professor of Geography, Yale Univ.
 1966-67 Associate professor of Geography and
 Community Planning, University of Rhode Island
 1967-69 Professor of Geography and regional planning,
 Chairman, Dept. of Geography, URI
 1969- Associate Dean of the Graduate School, URI

PROFESSIONAL SOCIETIES AND ACTIVITIES:
 Member: Association of American Geographers; American
 Geographical Society (advisory committee for Soviet
 Geography: Review and Translation 1960-65); Foreign
 Service Institute (occasional visiting lecturer on
 economic development of southeast Asia);
 Participant: Peace Corps training programs for
 Afghanistan, 1965, 1967; Summer Faculty, Institute
 in Middle Eastern Affairs, Williams College, 1962;
 13th Annual Near East Conference, Princeton, 1960;
 Leader, geographer's tour of Soviet Union, August
 1960; joint Yale Junior Faculty Fellowship-American
 Council of Learned Societies for research in London,
 West Pakistan, and India, Regional Effects of Par-
 tition and of the Indus Waters Division, 1963-64.

PUBLICATIONS: Total number over 20
 In Press "Impact of Modern Irrigation Technology in the
 Indus and Helmand Basins of Southwest Asia", The
 Careless Technology, Proceedings of Conference on
 Ecological Aspects of International Development,
 Natural History Press.
 1967 The Indus Rivers: A Study of the Effects of Partition,
 Yale University Press, New Haven.
 1967 Editor, Proceedings of the Second International
 Meeting of the Committee on Applied Geography, Inter-
 national Geographical Union.
 1967 "Pakistan", published as an issue of Focus, American
 Geographical Society

NAME: Geoffrey A. Motte
 BIRTH: ██████████ ██████████ ██████████ ██████████
 EDUCATION: Merchant Marine College, Southampton, England
 (2nd class honors) 1953
 Second Mate Foreign-going license, College of
 Technology, Liverpool, England 1957
 First Mate - Foreign-going, College of Technology,
 Cardiff, Wales, 1959
 Masters, Foreign-going, College of Advanced
 Technology, Cardiff, Wales, 1961
 Extra Master, legal section, Cardiff, Wales, 1962

EMPLOYMENT: 1954-57 Ship's officer on Australian coast
 1957-59 Ship's officer in the Far East
 1959-62 Ship master on West African coast
 1962-63 Advanced College of Technology, South Wales
 1963-66 Lecturer of Nautical Science at College
 of Fisheries in Canada
 1966- Associate Professor Equivalent in Fisheries
 and Marine Technology, Univ. of Rhode Island

PROFESSIONAL SOCIETIES AND ACTIVITIES:
 Member of the Institute of Navigation; member of
 Company of Bristol Channel Pilots

PUBLICATIONS:
 1969 Chart Work for Fishermen and Boat Operators
 1969 Navigation for Fishermen and Boat Operators
 1970 Selecting a Radar Set for a Fishing Vessel (S.T.S.)

NAME: Lawrence E. Ousterhout

BIRTH: [REDACTED] [REDACTED] [REDACTED]

EDUCATION: B.S. Oregon State University, 1943
Ph.D. University of California, 1959

EMPLOYMENT: 1943-46 U.S. Army
1946-56 Operated own farm in Oregon
1956-59 Research Assistant, California
1959-61 Bureau of Commercial Fisheries, Maryland
1961-66 Manager, Poultry Feed Research, Quaker
Oats Company
1966- Associate Professor in Animal Science,
University of Rhode Island

PROFESSIONAL SOCIETIES AND ACTIVITIES:

Member: Animal Nutrition Council; Poultry Science
Association; American Institute of Nutrition;
various scholastic honorary associations
Consultant: Wallace Menhaden Co.; Wilber Ellis Co.;
Jack Frost Poultry; Moore Farming Co.; B.C. Rogers
and Sons; Koch Turkey Farm; Quaker Oats Co.

PUBLICATIONS: Total number over 30

1967 The Effect of Kaolin on the Feed Efficiency of
Chickens, Poultry Science, 45:1303
1968 with L. D. Matterson, The Influence of Antioxidants
on the Available Energy of Fish Meals, Poultry
Science, 47:1694
1968 Practical Methods for the Quality Control of
Protein Feedstuffs, Feedstuffs, 40:20
1968 Fish Meal Quality Control as it Affects Feed
Formulation, Feedstuffs, 40:18
1970 The 'Nutritional' Effects of 'Clays' in Feeds,
Feedstuffs, 42:1:34
1970 with E. M. Wood, Available Lysine in Fish Meals:
Chemical (TNBS) Method Compared With Chick Assay